

PROTECTIVE COVER FOR HORIZONTAL PNEUMATIC FENDER,
HORIZONTAL PNEUMATIC FENDER, AND METHOD FOR USING
HORIZONTAL PNEUMATIC FENDER

Technical Field

[0001]

The present invention relates to a protective cover for a horizontal pneumatic fender, a horizontal pneumatic fender, and a method for using a horizontal pneumatic fender, and particularly relates to a protective cover for a horizontal pneumatic fender capable of suppressing adherence of oil that floats on a water surface, which causes swelling and deterioration of the fender, a horizontal pneumatic fender, and a method for using a horizontal pneumatic fender.

Background Art

[0002]

There have been known pneumatic fenders that are designed to prevent damage to hulls and a pier when boats and ships come alongside the pier. These pneumatic fenders are installed on a wall face of the pier or on the ship side. The pneumatic fender is a hollow body formed from a rubber in which a reinforcing material is embedded. Air is encapsulated in this hollow interior and, when a boat or a ship comes alongside the pier, the shock is absorbed by an elastic force produced by the encapsulated air.

[0003]

The modes of the pneumatic fender can be broadly classified into two types: horizontal and vertical. The horizontal pneumatic fender is used with the fender floating on the water and the longitudinal direction positioned horizontally. The vertical pneumatic fender is used with the fender floating on the water and the longitudinal direction positioned vertically, with a portion of the fender submerged in the water by storage of a predetermined amount of water in the hollow interior.

[0004]

However, when oil drifts and accumulates in a water area where the pneumatic fender is installed, the oil that floats on the water surface adheres to the outer surface of the pneumatic fender. When this state lasts for a long period of time with a conventional pneumatic fender, which does not take into consideration such oil, the rubber in the portion where the oil adhered swells and deteriorates. As a result, the problem arises that the pneumatic fender can no longer be used and the service life is shortened.

[0005]

For horizontal pneumatic fenders, there has been proposed a sheet-shaped protective member that covers the outer surface of the fender (refer to Patent Document 1, for example). Nevertheless, this protective member is designed to prevent outer damage to the fender caused by contact with the hull or the like, and is not intended to address the swelling and deterioration caused by the oil described above. Then, when this protective member is mounted on the fender, there are seams in a circumferential direction and breaks on both left and right end portions. The horizontal pneumatic fender rotates about a center axis of a hemispherical portion during use and thus, even when this protective member is mounted, the oil that floats on the water surface passes through the seams and breaks and adheres to the outer surface of the fender. This makes it difficult to suppress the swelling and deterioration of the fender using this protective member.

Citation List Patent Literature

[0006]

Patent Document 1: Japanese Unexamined Patent Application Publication No. H5-25812A

Summary of Invention Technical Problem

[0007]

An object of the present invention is to provide a protective cover for a horizontal pneumatic fender capable of suppressing adherence of oil that floats on a water surface, which causes swelling and deterioration of a fender, a horizontal pneumatic fender, and a method for using a horizontal pneumatic fender.

Solution to Problem

[0008]

A protective cover for a horizontal pneumatic fender according to the present invention for achieving the above-described object is a protective cover removably mounted on a horizontal pneumatic fender including bowl-shaped hemispherical portions connected to both left and right ends of a body portion having a cylindrical shape. The protective cover for a horizontal pneumatic fender includes a protective layer body and an attachment portion. The protective layer body covers at least an entire outer surface of the body portion and a region of an outer surface on an outer side in a radial direction of each of the hemispherical portions constituting half of a total surface area of the hemispherical portion. The attachment portion disposes the

protective layer body in a predetermined position on the fender. When the protective layer body is disposed in the predetermined position of the fender, the protective layer body enables separation of oil that floats on the water surface and the range of the fender covered with the protective layer body.

[0009]

A horizontal pneumatic fender according to the present invention is a horizontal pneumatic fender including a body portion having a cylindrical shape, and bowl-shaped hemispherical portions connected to both left and right ends of this body portion. The horizontal pneumatic fender further includes a protective layer body that is removable and covers at least an entire outer surface of the body portion and a region of an outer surface on an outer side in a radial direction of each of the hemispherical portions constituting half of a total surface area of the hemispherical portion. This protective layer body enables separation of oil that floats on the water surface and the range of the fender covered with the protective layer body.

[0010]

Another horizontal pneumatic fender according to the present invention is a horizontal pneumatic fender including a body portion having a cylindrical shape, and bowl-shaped hemispherical portions connected to both left and right ends of this body portion. The horizontal pneumatic fender further includes a protective layer body that covers at least an entire outer surface of the body portion and a region of an outer surface on an outer side in a radial direction of each of the hemispherical portions constituting half of a total surface area of the hemispherical portion. The protective layer body is composed of an oil resistant member, and is integrally provided by vulcanization bonding. This protective layer body enables separation of oil that floats on the water surface and the range of the fender covered with the protective layer body.

[0011]

A method for using a horizontal pneumatic fender according to the present invention includes setting and installing the horizontal pneumatic fender described above in a position where a lower end position of an inner circumferential edge of the protective layer body of each hemispherical portion is higher than a water surface position and thus, when oil that floats in a water area where the fender is installed, separating the oil and the range of the fender covered with the protective layer body by the protective layer body.

Advantageous Effects of Invention

[0012]

According to the present invention, a protective layer body that covers at least an entire outer surface of the body portion and a region of an outer surface on an outer side in a radial direction of each of the hemispherical portions constituting half of a total surface area of the hemispherical portion is provided. The protective layer body allows oil that floats on the water surface and the range of the fender covered with the protective layer body to be separated. This prevents the range covered with the protective layer body from swelling and deterioration by the oil that floats on the water surface. In addition, with use of the layer-shaped protective layer body, adverse effects on the shock-absorbing performance and the like of the fender are substantially non-existent.

[0013]

When the protective layer body covers the entire outer surface of the body portion as well as an entire outer surface of each of the hemispherical portions, the entire outer surface of the fender is substantially protected by the protective layer body from the oil that floats on the water surface. Such a protective layer body is even more advantageous in suppressing the swelling and deterioration of the fender.

[0014]

When the protective layer body is composed of an oil resistant member, the protective layer body is effective in preventing the swelling and deterioration of the range of the fender covered with the protective layer body. Examples of the oil resistant member include an elastic member that contains acrylonitrile butadiene rubber.

Brief Description of Drawings

[0015]

FIG. 1 is an explanatory view illustrating an embodiment of a protective cover for a horizontal pneumatic fender according to the present invention as viewed from the side.

FIG. 2 is an explanatory view illustrating the protective cover for a horizontal pneumatic fender in FIG. 1 as viewed from the front from a hemispherical portion.

FIG. 3 is an explanatory view illustrating another embodiment of the protective cover for a horizontal pneumatic fender according to the present invention as viewed from the side.

FIG. 4 is an explanatory view illustrating the protective cover for a horizontal pneumatic fender in FIG. 3 as viewed from the front from the hemispherical portion.

FIG. 5 is an explanatory view illustrating an embodiment of a horizontal pneumatic fender according to the present invention as viewed from a vertical cross section.

FIG. 6 is an explanatory view illustrating another embodiment of the horizontal pneumatic fender as viewed from a vertical cross section.

FIG. 7 is an explanatory view illustrating the horizontal pneumatic fender as viewed from a vertical cross section.

Description of Embodiments

[0016]

Hereinafter, a protective cover for a horizontal pneumatic fender, a horizontal pneumatic fender, and a method for using a horizontal pneumatic fender according to the present invention will be described with reference to embodiments illustrated in the drawings.

[0017]

A conventional horizontal pneumatic fender 1A (hereinafter referred to as the “fender 1A”) includes a body portion 1a having a cylindrical shape, and hemispherical portions 1b having a bowl shape and connected to both left and right ends of the body portion 1a, as illustrated in FIG. 7. The hemispherical portions 1b on the left and right sides are respectively provided with a fitting 1c and a fitting 1d. The fitting 1c only may be provided in the hemispherical portion 1b on one side.

[0018]

The body portion 1a and the hemispherical portion 1b are composed of a member obtained by layering a plurality of reinforcing layers between an inner layer rubber and an outer layer rubber. The hollow internal space formed by the body portion 1a and the hemispherical portions 1b is inflated with an air A. In the drawings, the boundaries between the body portion 1a and the hemispherical portions 1b are each indicated by an alternate long and two short dashed line.

[0019]

The fitting 1c is provided with an injection port for injecting the air A, a safety valve that prevents an internal pressure of the fender 1A from becoming excessive, a pressure sensor that measures this internal pressure, and the like. Respective first end portions of separate guy chains 5 are connected to the fittings 1c, 1d.

[0020]

When the fender 1A is installed on the wall face of the pier or on the ship side, each of second end portions of the guy chains 5 connected to the fittings 1c, 1d is fixed to the pier or the hull. Then, the fender 1A in which the air A is stored in the hollow internal space is made to float on the ocean or the like and installed with the longitudinal direction (axial direction of the body portion 1a) set horizontally.

[0021]

As a result, when an oil C drifts and accumulates in the water area where the fender 1A is installed, the oil C floating on the water surface always comes into contact with the body portion 1a and the hemispherical portions 1b. When the fender 1A is continuously used as is, the outer layer rubber that forms the body portion 1a and the hemispherical portions 1b swells due to the oil C. This swelling causes a decrease in the strength and the like of the body portion 1a and the hemispherical portions 1b, making the fender 1A no longer usable.

[0022]

Here, a protective cover 2 for a horizontal pneumatic fender (hereinafter referred to as the “protective cover 2”) according to the present invention illustrated in FIGS. 1 and 2 is used. This protective cover 2 includes a protective layer body 3 and an attachment portion 4. The protective layer body 3 covers at least an entire outer surface of the body portion 1a and a region on the outer side in a radial direction of each of the hemispherical portions 1b constituting half of a total surface area of the hemispherical portion 1b. The attachment portion 4 disposes the protective layer body 3 in a predetermined position on the fender 1A.

[0023]

The protective layer body 3 is a sheet obtained by forming an elastic material such as a rubber, or a resin into a thin layer, and has a thickness of, for example, from 1 mm to 30 mm. The protective layer body 3 has specifications that substantially prevent water seepage. The protective layer body 3 having a cylindrical shape is continuous in both the circumferential direction and the axial direction, without breaks. The protective layer body 3 is manufactured by integrally molding a member into a cylindrical shape. Alternatively, the protective layer body 3 having a cylindrical shape is manufactured by bonding a plurality of members together. In this case, the bonded seams of each member are made to have specifications that prevent the passage of the oil C by machining without generation of gaps. The protective layer body 3 having a cylindrical shape and outserted on the fender 1A covers at least the entire outer surface of the body portion 1a and a region on an outer side in a radial direction of each of the hemispherical portions 1b constituting half of the total surface area of the hemispherical portion 1b. Note that the total surface area of the hemispherical portion 1b does not include the surface areas of the fittings 1c, 1d.

[0024]

The region of the hemispherical portion 1b covered with the protective layer body 3 is more specifically a toric region from an outer edge of the hemispherical portion 1b to a dimension H on an inner side in the radial direction, as illustrated in FIG. 2. This dimension H is, for example, set to 1 m or greater, and more preferably

to 2 m or greater. A surface area constituting half of the total surface area or greater of each of the hemispherical portions 1b may be covered with the protective layer body 3.

[0025]

The protective layer body 3 may be formed using an oil resistant member, or may be formed using a non-oil resistant member. Further, the protective layer body 3 may be formed using an elastic member, or may be formed using a non-elastic member. For example, the protective layer body 3 may be formed using an elastic member that contains acrylonitrile butadiene rubber superior in oil resistance. Other examples of an elastic member having oil resistance include fluororubber, chloroprene rubber, and chlorinated polyethylene rubber.

[0026]

The areas between the inner surface of the protective layer body 3 and the outer surfaces of the body portion 1a as well as the hemispherical portions 1b may each include somewhat of a gap, or may be adhesion bonded without a gap. When the protective layer body 3 is composed of the elastic member, the protective layer body 3 having a cylindrical shape is expanded in diameter and outserted on the body portion 1a and the hemispherical portions 1b, thereby making it possible to adhesion bond the inner surface of the protective layer body 3 and the outer surface of the body portion 1a.

[0027]

Examples of the attachment portion 4 used include a cord 4b (right-side cord 4b) that connects the protective layer body 3 outserted on the fender 1A and the hemispherical portion 1b on the right side, and a cord 4b (left-side cord 4b) that connects the protective layer body 3 and the hemispherical portion 1b on the left side. With the right-side cord 4b, a right end portion of the protective layer body 3 and the surface of the hemispherical portion 1b on the right side are directly connected, or the right end portion of the protective layer body 3 and the fitting 1c provided in the hemispherical portion 1b on the right side are connected. With the left-side cord 4b, a left end portion of the protective layer body 3 and the surface of the hemispherical portion 1b on the left side are directly connected, or the left end portion of the protective layer body 3 and the fitting 1d provided in the hemispherical portion 1b on the left side are connected.

[0028]

In this embodiment, a first end portion of the right-side cord 4b is connected to a right end opening edge portion of the protective layer body 3 via a connecting member 4a. A second end portion of the right-side cord 4b is connected to the fitting 1c via a fixing member 4c fitted on the fitting 1c. A first end portion of the left-side

cord 4b is connected to a left end opening edge portion of the protective layer body 3 via the connecting member 4a. A second end portion of the left-side cord 4b is connected to the fitting 1d via the fixing member 4c fitted on the fitting 1d.

[0029]

As the cord 4b, a rope made from a resin or a natural fiber, a metal chain, or the like may be used. Use of a rope made from a resin or a natural fiber as the cord 4b is effective in preventing the occurrence of scratches on the surface of the hemispherical portions 1b caused by the cord 4b.

[0030]

When this protective cover 2 is used, the protective cover 2 is attached on the ground or on the ship to the fender 1A in which the air A is stored in the hollow internal space. Subsequently, as illustrated in FIG. 1, the fender 1A is installed on the wall face of the pier or on the ship side. A lower end position on the inner circumferential edge of the protective layer body 3 of each of the hemispherical portions 1b is set to a position higher than the water surface position.

[0031]

When the oil C drifts to the water area where the fender 1A is installed and a periphery of the fender 1A is surrounded by the oil C floating on the water surface, the oil C continuously adheres to the outer surface of the protective layer body 3. The body portion 1a and a certain amount of the region on the outer side in the radial direction of the hemispherical portions 1b are covered with the protective layer body 3, and are therefore separated from the oil C without the oil C adhering thereto, even when the fender 1A is rotated about a cylinder center line. While the oil C fluctuates with the water surface, the vertical fluctuation of the water surface during normal periods in a harbor or the like is about from 1 to 2 m. Further, the fender 1A moves vertically in synchrony with the waves (water surface) to a certain extent. Thus, the vertical fluctuation range of the water surface position is the lower end portion of the body portion 1a positioned in a horizontal state.

[0032]

Even when there are somewhat gaps between the inner surface of the protective layer body 3 and the outer surfaces of the body portion 1a as well as the hemispherical portions 1b, the oil C never enters the gaps as long as the water surface position does not exceed the lower end position of the inner circumferential edge of the protective layer body 3 at each of the hemispherical portions 1b. Thus, excluding when the waves are higher than normal, the range of the fender 1A covered with the protective layer body 3 is separated from the oil C, making it possible to avoid the adherence of the oil C on the fender 1A during normal periods. During non-normal periods (when the waves are high), use of the fender 1A may be avoided.

Thus, use of the protective cover 2 according to the present invention makes it possible to effectively suppress the swelling and deterioration of the fender 1A caused by the oil C floating on the water surface.

[0033]

Further, with use of the thin, layer-shaped protective layer body 3, compaction and restoration deformation of the fender 1A are not greatly difficult even when the protective cover 2 is attached to the fender 1A. As a result, the shock absorbing performance and the like of the fender 1A are not substantially adversely affected by the protective cover 2.

[0034]

When the protective layer body 3 is composed of a non-oil resistant member, the protective layer body 3 deteriorates by swelling and the like due to the adhered oil C in earlier stages, compared to when formed by an oil resistant member. Thus, when deterioration of the protective layer body 3 is discovered, or after a preset period of time has elapsed, the deteriorated protective layer body 3 is removed from the fender 1A and replaced with a new protective layer body 3. Alternatively, the protective cover 2 may be replaced with a new protective cover 2.

[0035]

When the protective layer body 3 is composed of an oil resistant member, swelling and deterioration of the fender 1A in the range covered with the protective layer body 3 can be prevented over an extended period of time compared to when formed by a non-oil resistant member. This eliminates the need for replacement with a new protective layer body 3 (protective cover 2). Alternatively, the frequency of replacement with a new protective layer body 3 (protective cover 2) can be decreased.

[0036]

When the inner surface of the protective layer body 3 and the outer surfaces of the body portion 1a as well as the hemispherical portions 1b are adhesion bonded, the advantage arises that the protective layer body 3 is less likely to shift with respect to the fender 1A. This also makes it possible to decrease the strength of the attachment portion 4. Further, even when the water surface position exceeds the lower end positions of the inner circumferential edge of the protective layer body 3 at the hemispherical portions 1b, seepage of the oil C between the protective layer body 3 and the hemispherical portions 1b is less likely. When the inner surface of the protective layer body 3 and the outer surfaces of the body portion 1a and the hemispherical portions 1b are adhesion bonded, the protective layer body 3 is preferably composed of an elastic member capable of conforming to the compaction and restoration deformation of the fender 1A.

[0037]

When gaps are provided between the inner surface of the protective layer body 3 and the outer surfaces of the body portion 1a as well as the hemispherical portions 1b, the advantage arises that the compaction and restoration deformation of the fender 1A are less likely to be affected by the protective layer body 3. Further, the elasticity and the like required for conforming to the compaction and restoration deformation of the fender 1A decrease, thereby increasing the options of members that can be adopted as the protective layer body 3.

[0038]

In the embodiment described above, the outer surface of each of the hemispherical portions 1b is partially covered with the protective layer body 3, and an exposed section not covered with the protective layer body 3 exists. Here, in an embodiment of the protective cover 2 illustrated in FIGS. 3 and 4, the protective layer body 3 covers the entire outer surface of the body portion 1a and an entire outer surface of each of the hemispherical portions 1b.

[0039]

This protective layer body 3 differs from that in the previous embodiment only in the range of coverage of the fender 1A (the size of the protective layer body 3 with respect to the fender 1A).

[0040]

The attachment portion 4 in this embodiment is composed of a tightening band 4d and a tightening metal fitting 4e. The tightening band 4d tightens the openings on the right end and the left end of the protective layer body 3 having a cylindrical shape, and is fixed to the fittings 1c, 1d. The tightening metal fitting 4e tightens and fixes or releases the tightening band 4d at a predetermined length.

[0041]

To arrange this protective cover 2 in a predetermined position of the fender 1A, the protective layer body 3 is outserted on the fender 1A (the body portion 1a and each of the hemispherical portions 1b), and the openings on the right end and the left end of the protective layer body 3 are subsequently tightened with the attachment portion 4 and attached to the fittings 1c, 1d, respectively.

[0042]

According to this embodiment, the entire outer surface of the fender 1A is substantially separated and protected from the oil C floating on the water surface by the protective layer body 3. Such an embodiment is even more advantageous in suppressing the swelling and deterioration of the fender 1A.

[0043]

In this embodiment as well, the various configurations described in the previous embodiment can be adopted. In addition, usage and replacement can also be performed in the same way as in the previous embodiment.

[0044]

Further, a horizontal pneumatic fender 1 (hereinafter referred to as “fender 1”) according to the present invention removably includes the various protective layer bodies 3 described above for the conventional fender 1A.

[0045]

Another embodiment of the fender 1 is illustrated in FIG. 5.

[0046]

This fender 1 includes a protective layer body 3 that covers at least the entire outer surface of the body portion 1a and a region on the outer side in the radial direction of each of the hemispherical portions 1b constituting half of the total surface area of the hemispherical portion 1b. Further, the protective layer body 3 is integrated as the fender 1 by vulcanization bonding. That is, the inner surface of the protective layer body 3 is adhesion bonded and fixed to facing surfaces without any gaps. The protective layer body 3 may be additionally vulcanization bonded to the outer surface of the conventional fender 1A, or may be vulcanization bonded to the conventional fender 1A in place of providing the outer layer rubber of the conventional fender 1A.

[0047]

For the protective layer body 3, the various specifications described above may be used. However, the specifications do not allow removal or attachment of the protective layer body 3 only, and therefore the protective layer body 3 cannot be replaced. As a result, the protective layer body 3 is composed of an oil resistant member. Further, the protective layer body 3 needs to conform to the compaction and restoration deformation, and is therefore preferably composed of an elastic member made from rubber and the like.

[0048]

The method for using the fender 1 is the same as that in the embodiment described above. According to this fender 1, the range of the fender 1 covered with the protective layer body 3 is separated from the oil C floating on the water surface, making it possible to substantially avoid adherence of the oil C to the fender 1. Thus, the swelling and deterioration of the fender 1 caused by the oil C floating on the water surface can be effectively suppressed.

[0049]

This fender 1 has the advantages of eliminating the need for the attachment portion 4 described above, and eliminating shifting of the protective layer body 3.

[0050]

In the embodiment illustrated in FIG. 5, the outer surface of each of the hemispherical portions 1b is partially covered with the protective layer body 3, and an exposed section not covered with the protective layer body 3 exists. Here, in the embodiment of the fender 1 illustrated in FIG. 6, the protective layer body 3 cover the entire outer surface of the body portion 1a as well as the entire outer surface of each of the hemispherical portions 1b.

[0051]

According to this embodiment, the entire outer surface of the fender 1 is substantially separated and protected from the oil C floating on the water surface by the protective layer body 3. Such an embodiment is even more advantageous in suppressing the swelling and deterioration of the fender 1.

Reference Signs List

[0052]

- 1 Horizontal pneumatic fender according to present invention
- 1A Conventional horizontal pneumatic fender
- 1a Body portion
- 1b Hemispherical portion
- 1c Fitting (right side)
- 1d Fitting (left side)
- 2 Protective cover
- 3 Protective layer body
- 4 Attachment portion
- 4a Connecting member
- 4b Cord
- 4c Fixing member
- 4d Tightening band
- 4e Tightening metal fitting
- 5 Guy chain

Claims

[Claim 1]

A protective cover for a horizontal pneumatic fender removably mounted on a horizontal pneumatic fender including bowl-shaped hemispherical portions connected to both left and right ends of a body portion having a cylindrical shape, the protective cover for a horizontal pneumatic fender comprising:

a protective layer body that covers at least an entire outer surface of the body portion and a region of an outer surface on an outer side in a radial direction of each of the hemispherical portions constituting half of a total surface area of the hemispherical portion; and

an attachment portion that disposes the protective layer body in a predetermined position on the fender;

the protective layer body enabling separation of oil that floats on the water surface and the range of the fender covered with the protective layer body when the protective layer body is disposed in the predetermined position of the fender.

[Claim 2]

The protective cover for a horizontal pneumatic fender according to claim 1, wherein the protective layer body covers the entire outer surface of the body portion and an entire outer surface of each of the hemispherical portions.

[Claim 3]

The protective cover for a horizontal pneumatic fender according to claim 1 or 2, wherein the protective layer body is composed of an oil resistant member.

[Claim 4]

The protective cover for a horizontal pneumatic fender according to claim 3, wherein the oil resistant member is an elastic member that contains acrylonitrile butadiene rubber.

[Claim 5]

A horizontal pneumatic fender comprising: a body portion having a cylindrical shape;

bowl-shaped hemispherical portions connected to both left and right ends of the body portion; and

a protective layer body that is removable and covers at least an entire outer surface of the body portion and a region of an outer surface on an outer side in a radial

direction of each of the hemispherical portions constituting half of a total surface area of the hemispherical portion;

the protective layer body enabling separation of oil that floats on the water surface and the range of the fender covered with the protective layer body.

[Claim 6]

A horizontal pneumatic fender comprising: a body portion having a cylindrical shape;

bowl-shaped hemispherical portions connected to both left and right ends of the body portion; and

a protective layer body that covers at least an entire outer surface of the body portion and a region of an outer surface on an outer side in a radial direction of each of the hemispherical portions constituting half of a total surface area of the hemispherical portion;

the protective layer body being composed of an oil resistant member, being integrally provided by vulcanization bonding, and enabling separation of oil that floats on the water surface and the range of the fender covered with the protective layer body.

[Claim 7]

The horizontal pneumatic fender according to claim 5, wherein the protective layer body is composed of an oil resistant member.

[Claim 8]

The horizontal pneumatic fender according to claim 6 or 7, wherein the oil resistant member is an elastic member that contains acrylonitrile butadiene rubber.

[Claim 9]

The horizontal pneumatic fender according to any one of claims 5 to 8, wherein the protective layer body covers the entire outer surface of the body portion and an entire outer surface of each of the hemispherical portions.

[Claim 10]

A method for using a horizontal pneumatic fender, the method comprising:
setting and installing the horizontal pneumatic fender according to any one of claims 5 to 9 in a position where a lower end position of an inner circumferential edge of the protective layer body of each hemispherical portion is higher than a water surface position and thus, when oil floats in a water area where the fender is installed,

separating the oil and the range of the fender covered with the protective layer body by the protective layer body.

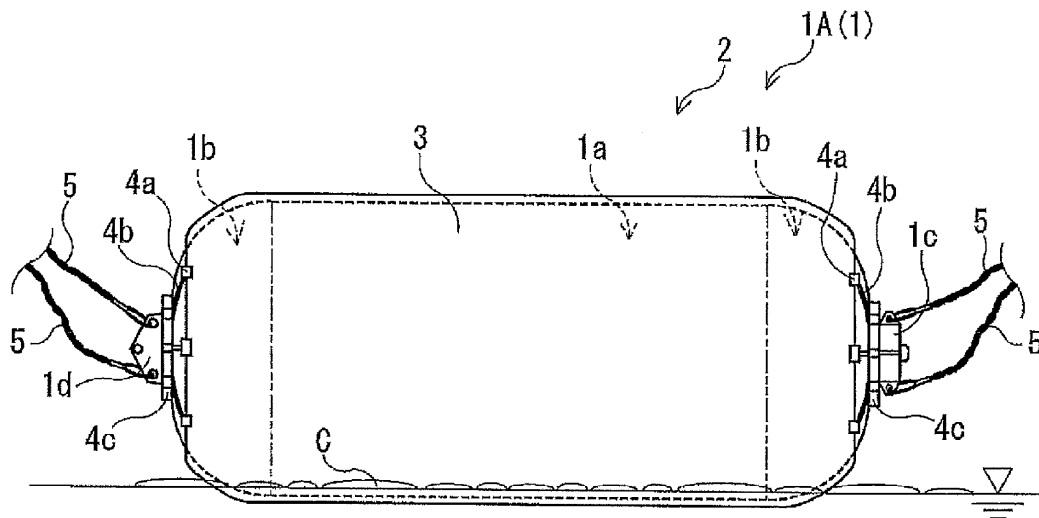


FIG. 1

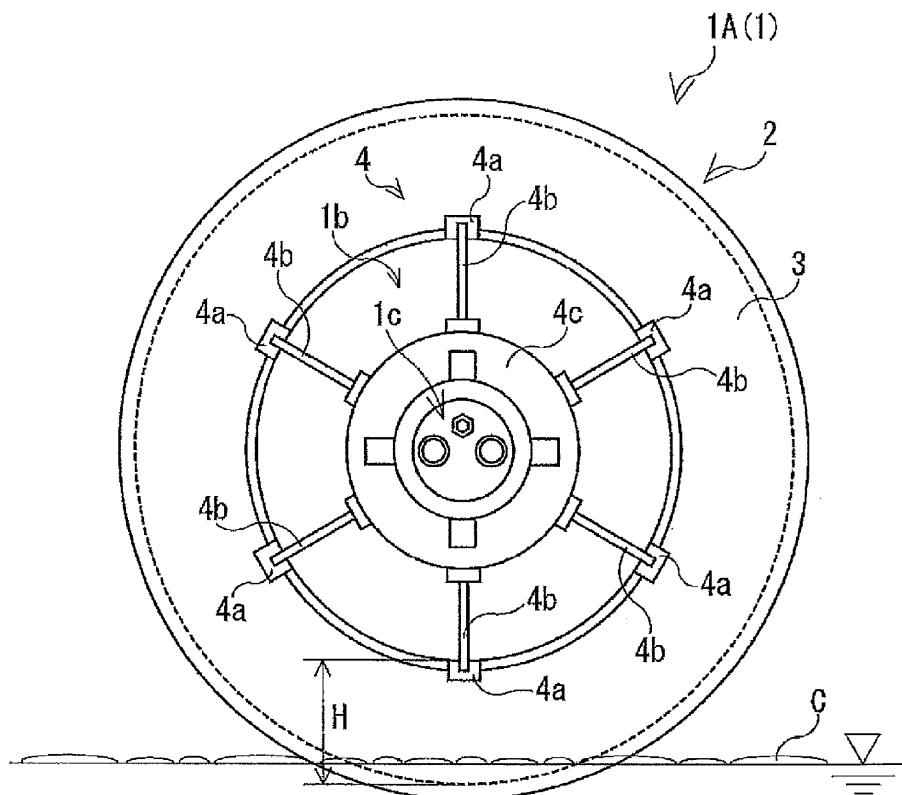


FIG. 2

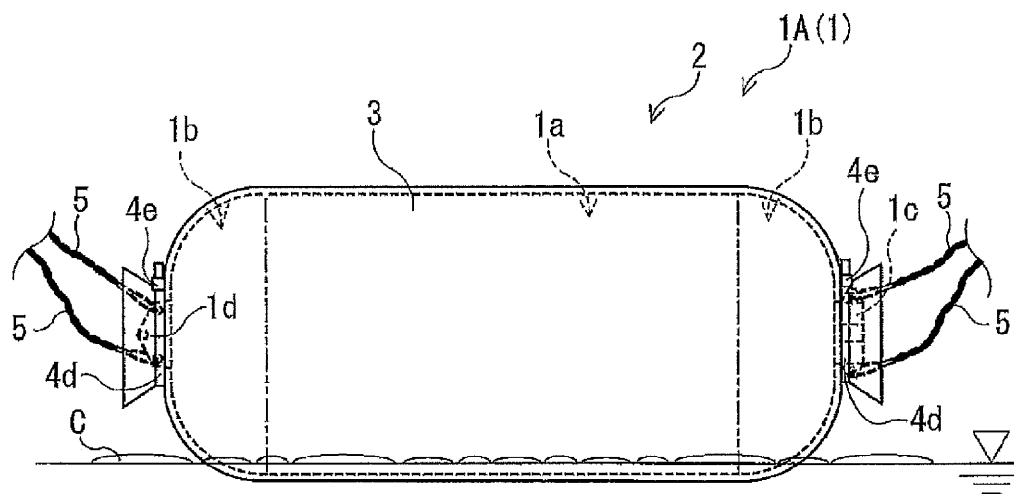


FIG. 3

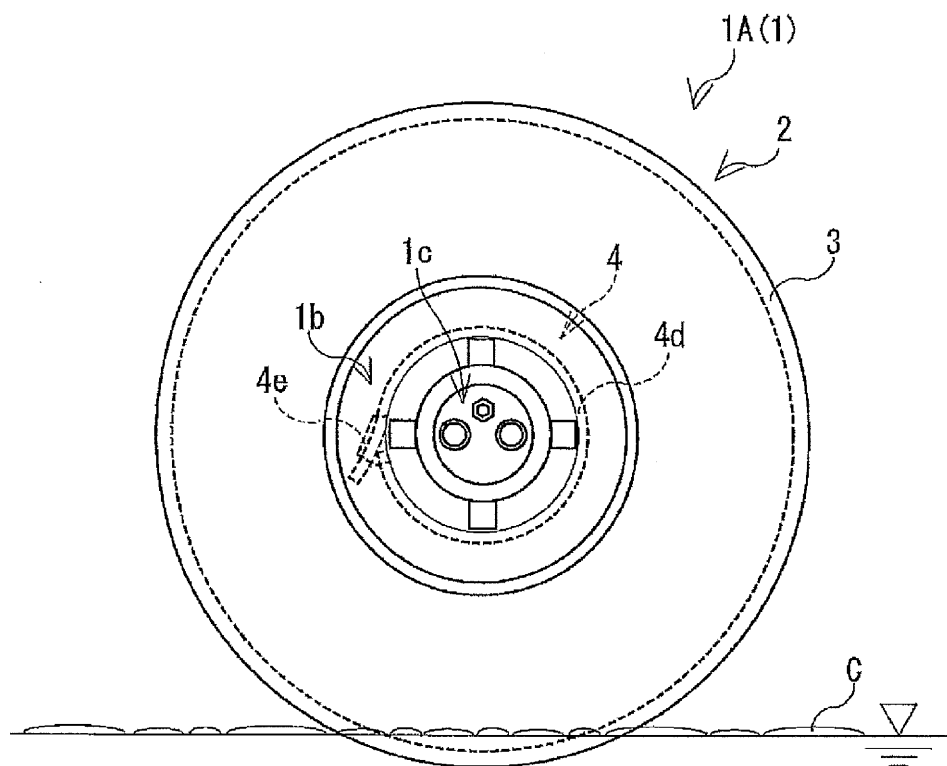


FIG. 4

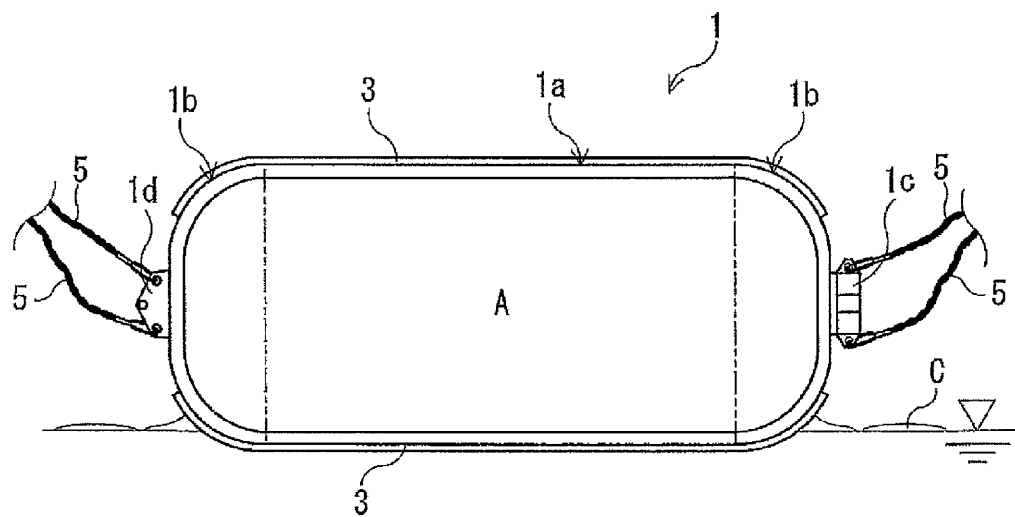


FIG. 5

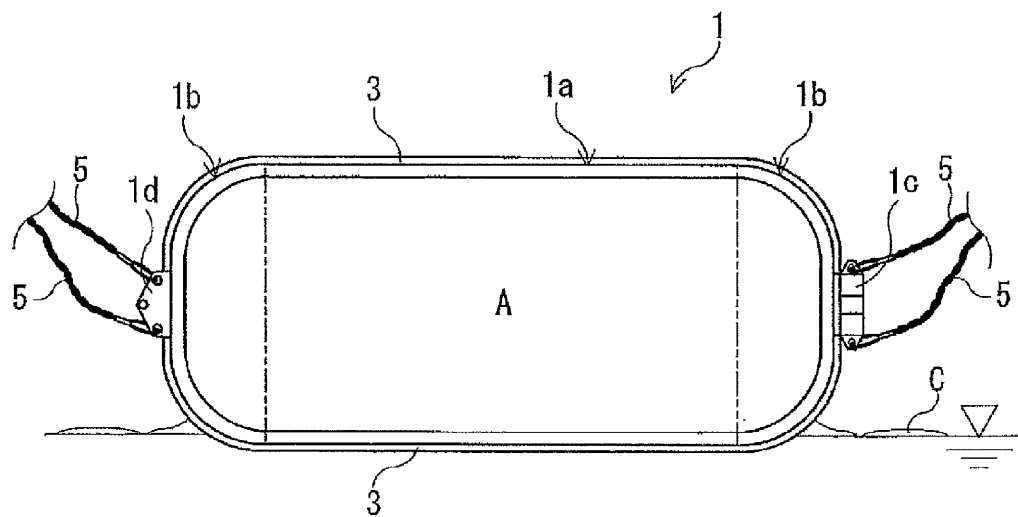


FIG. 6

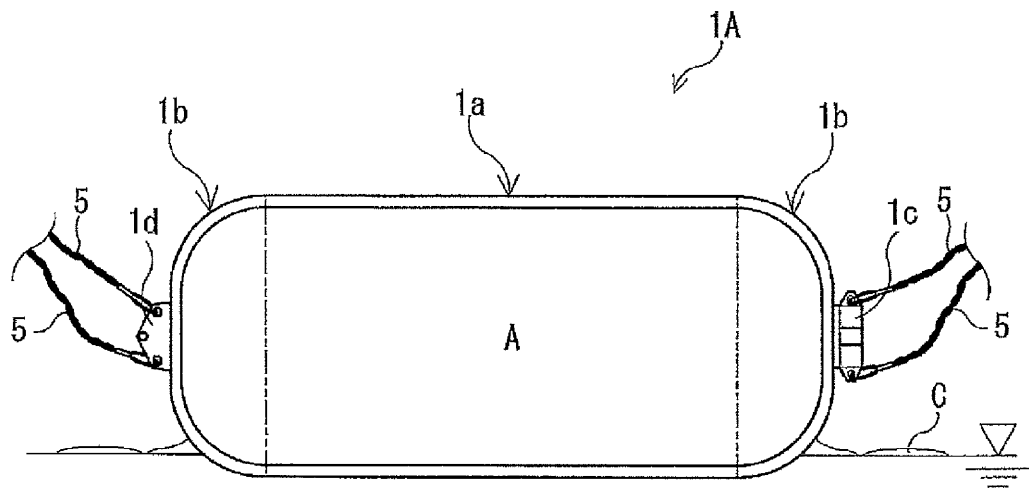


FIG. 7